LAMPIRAN

Lampiran

Perhitungan frekuensi rata-rata

f (Hz)	$f - \bar{f}$ (Hz)	$(f - \bar{f})^2$ (Hz)
3915,60	-1,10	1,21
3917,50	0,80	0,64
3915,30	-1,40	1,96
3916,30	-0,40	0,16
3918,50	1,80	3,24
3916,50	-0,20	0,04
3918,20	1,50	2,25
3917,30	0,60	0,36
3915,60	-1,10	1,21
3916,20	-0,50	0,25
3916,70		11,3200

Dengan f = frekuensi terukur

$\bar{f}$ = frekuensi rata-rata

Menggunakan deviasi standard : $s_{f'} = \sqrt{\dfrac{\sum_{i=1}^{i=k}(\delta f_i')^2}{k(k-1)}}$

Maka didapatkan $s_{f'} = \sqrt{\dfrac{11,3200}{10(10-1)}}$

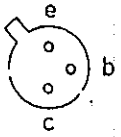
$= 0,3547$

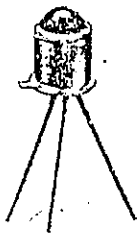
maka $\bar{f}' = (3916,7000 \pm 0,3547)$ Hz

LIGHT RESPONSIVE DEVICES

Phototransistor BPX25

A high sensitivity silicon planar NPN phototransistor for general purpose use. Top of package (TO 18) is lensed.





Absolute maximum ratings

V_{CBO}:	32V
V_{CEO}:	32V
V_{EBO}:	5V
I_C:	100mA
P_{TOT}:	300mW

Electrical characteristics
(open-circuit base, except for h_{FE} typical)

Light current (V_{CE} = 6V @ 1000 lux):	13mA
Dark current (V_{CE} = 24V):	100nA
h_{FE} (V_{CE} = 6V, I_C = 2mA):	500
Peak spectral response:	800nm
Cut-off frequency (Note 1):	200kHz

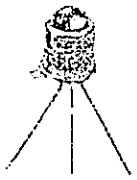
Note 1: Improved switching times can be obtained by connecting the base lead to give a quiescent bias current.

Order

QF30H (BPX25)..... £2.95

Phototransistor TIL81

A high sensitivity silicon planar NPN phototransistor for general purpose use. Top of package (TO 18) is lensed. Pin-out is the same as the BPX25.



Absolute maximum ratings

V_{CEO}:	50V
V_{CER}:	30V
V_{EBO}:	7V
I_C:	50mA
P_{TOT}:	250mW

Electrical characteristics
(open-circuit base, except for h_{FE} typical)

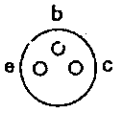
Light current (V_{CE} = 5V):	22mA
Dark current (V_{CE} = 10V):	20μA
h_{FE} (V_{CE} = 5V, I_C = 1mA):	200
Peak spectral response:	900nm
Cut-off frequency (Note 1):	1MHz

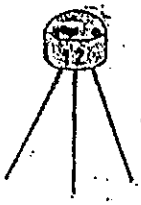
Note 1: These switching times can be obtained by connecting the base lead to give a quiescent bias current.

Order

QY82D (Infrared Sensr TIL81)..... £1.98

Photo-Darlington Transistor MEL12





A very high sensistivity silicon planar NPN photo-darlington transistor featuring a very high light current and low dark current

Absolute maximum ratings

V_{CBO}:	60V
V_{CEO}:	40V
V_{EBO}:	10V
I_C:	150mA
P_{TOT}:	200mW

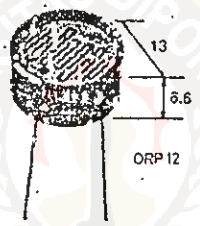
Electrical characteristics
(open-circuit base typical).

Light current (V_{CE} = 5V @ H = 2mW/cm²):	3mA
Dark current (V_{CE} = 5V):	100nA

Order

HQ61R (MEL 12)..... £1.06

Photoconductive Cell



A cadmium sulphide photoconductive cell sensitive to visible light. It has a maximum sensitivity in the green, yellow, orange and red parts of the spectrum (wavelengths 480-690nm). Resistances quoted below are those measured when the cell is illuminated by a lamp of colour temperature 2854°K. For other light sources the cell resistance should be multiplied by the following approximate factors.

Source of illumination	Multiplication Factor
Incandescent radiation at colour temperature of: 1500°K	x0.5
2000°K (oil-fired burner-yellow flame)	x0.66
Sunlight	x1.33
White fluorescent light	x2

Where cell is operated from a 50Hz AC source the resistance values are between 1 and 1.3 times those for DC.

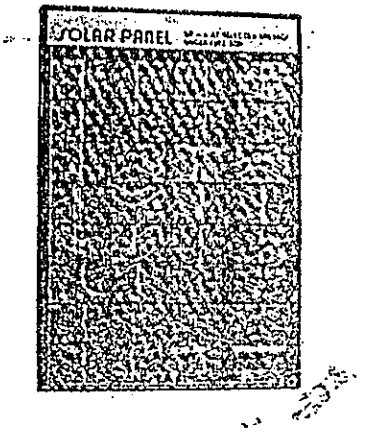
Type	Incidence of illumination	Cell resistance at 50 lux	Min. dark resistance
ORP12	End-on	600Ω	1MΩ
Type	Min bright resistance	Max. power dissipation	Max. cell voltage
ORP12	80Ω*	250mW	320V

* At 10,000 lux.

Order

HB10L (LDR ORP12)..... 98p

Solar Panels



Each solar panel contains rectangular shaped silicon solar cells connected so as to supply 9V or 12V at 50mA when the incident light is about 100mW sq. cm. The cells are mounted in an attractive and sturdy black plastic case. The plastic faceplate comprises hundreds of bubble magnifiers which maximise cell performance as they enhance the light striking the solar cells.

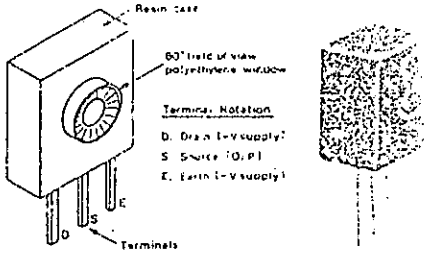
The cells are internally connected to a 2.5mm jack socket and a 2.5mm jack plug and approx 1m of twin flex is supplied with each panel.

Dimensions: Panel size 98 x 128mm.
Case size 146 x 105 x 13mm.

Order

RK23A (Solar Panel 9V)..... £9.95
RK24B (Solar Panel 12V)..... £11.95

Pyroelectric Infrared Sensor



A pyroelectric infrared sensor using a modified lead zirconate-titanate element. An output voltage is generated when the incident energy changes. Energy in the range 1μm to 20μm is detected, but the sensor has sharp insensitive notches at 3.5μm, 6.8μm and 13.9μm. The sensor has an internal FET with a 10kΩ source resistor between output and negative.

Specification at 25°C

Responsivity (500°K, 1Hz, 1Hz):	1100V/W
Specific detectivity:	~1 x 10^8cmHz$^{\frac{1}{2}}$W^{-1}
Wavelength range:	1 to 20μm
Rise time:	<25ms
Field of view:	60°
Window material:	Polyethylene
Electrode:	2mm diameter
Supply voltage:	3 to 15V
Operating temperature range:	−20° to +70°C
Body dimensions:	9mm wide, 11.7mm high, 6.2mm deep excl window
Window bezel:	6mm diameter raised 1mm from surface with centre 3.7mm from top of body.
Pins:	9mm long on 2.5mm centres

Order

FD13P (I'R Detector F001P) £5.95

February 2000

National Semiconductor

LM555
Timer

General Description

The LM555 is a highly stable device for generating accurate time delays or oscillation. Additional terminals are provided for triggering or resetting if desired. In the time delay mode of operation, the time is precisely controlled by one external resistor and capacitor. For astable operation as an oscillator, the free running frequency and duty cycle are accurately controlled with two external resistors and one capacitor. The circuit may be triggered and reset on falling waveforms, and the output circuit can source or sink up to 200mA or drive TTL circuits.

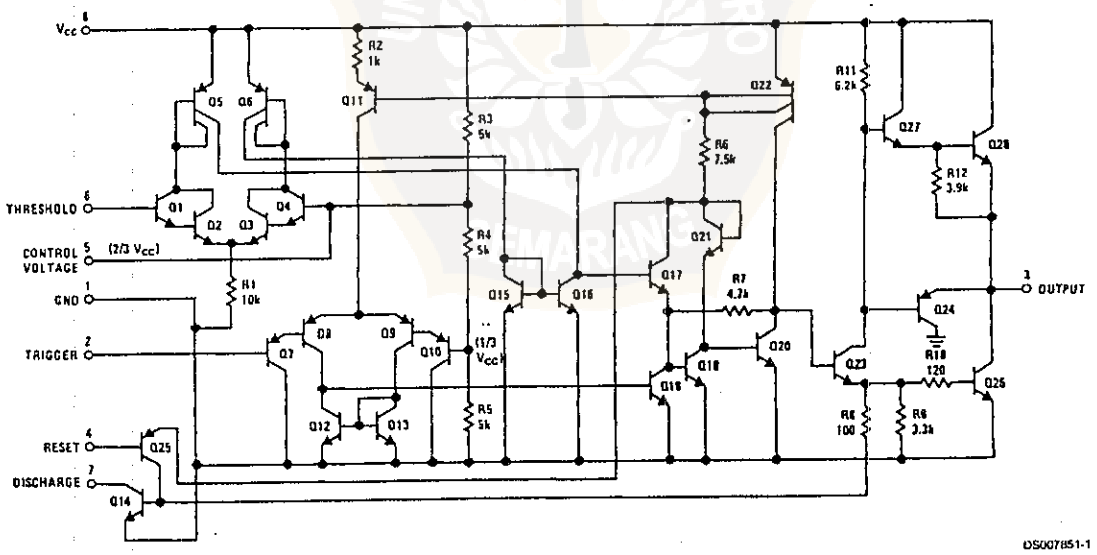
Features

- Direct replacement for SE555/NE555
- Timing from microseconds through hours
- Operates in both astable and monostable modes
- Adjustable duty cycle
- Output can source or sink 200 mA
- Output and supply TTL compatible
- Temperature stability better than 0.005% per ˚C
- Normally on and normally off output
- Available in 8-pin MSOP package

Applications

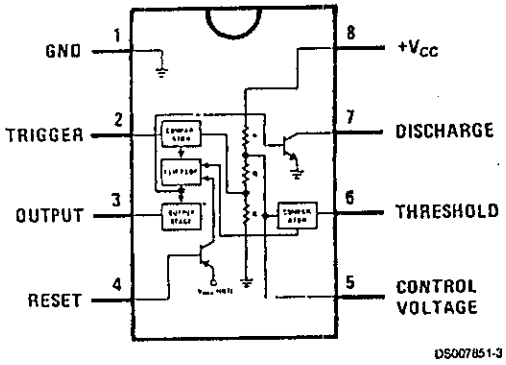
- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Linear ramp generator

Schematic Diagram



Connection Diagram

Dual-In-Line, Small Outline and Molded Mini Small Outline Packages



Top View

Ordering Information

Package	Part Number	Package Marking	Media Transport	NSC Drawing
8-Pin SOIC	LM555CM	LM555CM	Rails	M08A
	LM555CMX	LM555CM	2.5k Units Tape and Reel	
8-Pin MSOP	LM555CMM	Z55	1k Units Tape and Reel	MUA08A
	LM555CMMX	Z55	3.5k Units Tape and Reel	
8-Pin MDIP	LM555CN	LM555CN	Rails	N08E

Absolute Maximum Ratings (Note 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage	+18V
Power Dissipation (Note 3)	
LM555CM, LM555CN	1180 mW
LM555CMM	613 mW
Operating Temperature Ranges	
LM555C	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Soldering Information

Dual-In-Line Package	
Soldering (10 Seconds)	260°C
Small Outline Packages	
(SOIC and MSOP)	
Vapor Phase (60 Seconds)	215°C
Infrared (15 Seconds)	220°C

See AN-450 "Surface Mounting Methods and Their Effect on Product Reliability" for other methods of soldering surface mount devices.

Electrical Characteristics (Notes 1, 2)

(T_A = 25°C, V_{CC} = +5V to +15V, unless othewise specified)

Parameter	Conditions	Limits LM555C			Units
		Min	Typ	Max	
Supply Voltage		4.5		16	V
Supply Current	V_{CC} = 5V, R_L = ∞ V_{CC} = 15V, R_L = ∞ (Low State) (Note 4)		3 10	6 15	mA
Timing Error, Monostable					
Initial Accuracy			1		%
Drift with Temperature	R_A = 1k to 100kΩ, C = 0.1μF, (Note 5)		50		ppm/°C
Accuracy over Temperature			1.5		%
Drift with Supply			0.1		%/V
Timing Error, Astable					
Initial Accuracy			2.25		%
Drift with Temperature	R_A, R_B = 1k to 100kΩ, C = 0.1μF, (Note 5)		150		ppm/°C
Accuracy over Temperature			3.0		%
Drift with Supply			0.30		%/V
Threshold Voltage			0.667		x V_{CC}
Trigger Voltage	V_{CC} = 15V V_{CC} = 5V		5 1.67		V V
Trigger Current			0.5	0.9	μA
Reset Voltage		0.4	0.5	1	V
Reset Current			0.1	0.4	mA
Threshold Current	(Note 6)		0.1	0.25	μA
Control Voltage Level	V_{CC} = 15V V_{CC} = 5V	9 2.6	10 3.33	11 4	V
Pin 7 Leakage Output High			1	100	nA
Pin 7 Sat (Note 7)					
Output Low	V_{CC} = 15V, I_7 = 15mA		180		mV
Output Low	V_{CC} = 4.5V, I_7 = 4.5mA		80	200	mV

Electrical Characteristics (Notes 1, 2) (Continued)

(T_A = 25°C, V_{CC} = +5V to +15V, unless otherwise specified)

Parameter	Conditions	Limits			Units
		LM555C			
		Min	Typ	Max	
Output Voltage Drop (Low)	V_{CC} = 15V				
	I_{SINK} = 10mA		0.1	0.25	V
	I_{SINK} = 50mA		0.4	0.75	V
	I_{SINK} = 100mA		2	2.5	V
	I_{SINK} = 200mA		2.5		V
	V_{CC} = 5V				
	I_{SINK} = 8mA				V
	I_{SINK} = 5mA		0.25	0.35	V
Output Voltage Drop (High)	I_{SOURCE} = 200mA, V_{CC} = 15V		12.5		V
	I_{SOURCE} = 100mA, V_{CC} = 15V	12.75	13.3		V
	V_{CC} = 5V	2.75	3.3		V
Rise Time of Output			100		ns
Fall Time of Output			100		ns

Note 1: All voltages are measured with respect to the ground pin, unless otherwise specified.

Note 2: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits. Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the Operating Ratings. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 3: For operating at elevated temperatures the device must be derated above 25°C based on a +150°C maximum junction temperature and a thermal resistance of 106°C/W (DIP), 170°C/W (S0-8), and 204°C/W (MSOP) junction to ambient.

Note 4: Supply current when output high typically 1 mA less at V_{CC} = 5V.

Note 5: Tested at V_{CC} = 5V and V_{CC} = 15V.

Note 6: This will determine the maximum value of $R_A + R_B$ for 15V operation. The maximum total ($R_A + R_B$) is 20MΩ.

Note 7: No protection against excessive pin 7 current is necessary providing the package dissipation rating will not be exceeded.

Note 8: Refer to RETS555X drawing of military LM555H and LM555J versions for specifications.